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 (71) Applicant: **Komori Printing Machinery Co., Ltd.**  
 11-1, Azumabashi 3-chome  
 Sumida-ku Tokyo(JP)

 (72) Inventor: **Kusaka, Akehiro c/o Sekiyado Works**  
**Komori Printing Mach. Co. Ltd. 210**  
**Kirigasaku**  
**Sekiyadomachi Higashikatsushikagun**  
**Chiba(JP)**

 (74) Representative: **Patentanwälte Wenzel & Kalkoff**  
**Grubes Allee 26 Postfach 730466**  
**D-2000 Hamburg 73(DE)**

 (54) **Abnormal-paper sensing apparatus in a printing machine.**

(57) An abnormal-paper sensing apparatus in a printing machine which senses the presence of a front folded corner of a sheet of printing paper. The sheet of paper (7) hits against front lays (5) provided at a front end of an insertion guide plate (1) and stops. The insertion guide plate has a pair of recesses (8) provided in a front end portion thereof so as to extend thereacross at positions where the recesses can face the front corners of the sheet of paper which passes over the recesses. The recesses have a triangular cross section with a longer side (8a) positioned on the side of the front end of the insertion guide plate and with a shorter side (8b) positioned on the side of the rear end of the insertion guide plate. When the sheet of paper hits against front lays and stops, and if the sheet of paper has a folded angle at its front end, the corresponding recess is exposed and reflects the projected light diffusively, so that the sensors do not receive a quantity of reflected light enough to continue paper feeding.

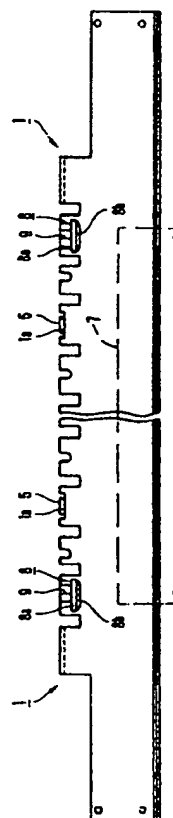


FIG. 1

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## Abnormal-paper Sensing Apparatus in a Printing Machine

### Background of the Invention

This invention relates to printing machines and more particularly to an abnormal-paper sensing apparatus in the printing machine which senses a folded corner of a sheet of printing paper which hits against front lays provided at a front end of an insertion guide plate and stops thereat in response to the absence of reflected light from the folded corner of the sheet of paper.

In a sheet-fed printing machine, sheets of printing paper stacked on a stacker of a paper feeder are drawn and fed one by one by a sucker, starting with the top sheet, to a feeder board and then delivered onto an insertion guide plate with the aid of a carrier tape and feed rolls. The sheet of paper then hits against front lays provided at a front end of the insertion guide plate and stops thereat with it being adjusted with reference to the vertical by the front lays and also with respect to right and left by a transverse needle device. The sheet of paper which has hit against the lays and stopped is then captured and carried by a pawl of a swing device and then is printed while it is being carried with it being substitutively captured by a thicker pawl.

Sheets of paper are required to be fed one by one to the printing machine without being bent or folded. Therefore, when undesirable feeding, such as feeding of a sheet of paper having a folded corner or double-sheet feeding, has occurred, this fact is sensed and the capture by the pawls and the paper-feeding onto the insertion guide plate are stopped. An abnormal sheet of paper of this type is folded at its front right and/or left corner into a triangle. In order to sense this corner folding, reflection type sensors are conventionally provided several millimeters before the front lays above the sheet of paper to sense the presence of reflected light from the sheet of paper which hits against the front lays and stops to determine thereby that there is a corner folding in the sheet due to the fact that no reflected light is received. When a sheet of paper having a different size is used, the sensor is moved correspondingly.

In such corner folding sensor, however, the insertion guide plate itself will reflect light which is projected to its exposed portions. Therefore, the sensor is likely to determine erroneously that there is no corner folding and the paper feeding will be continued although, actually, there is a folded corner. In order to avoid this, through holes are provided in the insertion guide plate so as to cause the projected light to pass through the holes without reflecting the projected light when there is a

corresponding corner folding. However, in order to cope with a different paper size or to alter the sensing position, the holes must have the form of elongated ones or of slots, so that a sheet of paper sliding on the insertion guide plate may be hooked at its corner into the elongated hole and bent to operate the sensor thereby, thus stopping feeding of the sheet of paper. The provision of such an elongated hole would weaken the strength of the end portion of the insertion guide plate.

### Summary of the Invention

Therefore, it is the object of the present invention to provide an improved abnormal-paper sensing apparatus in a printing machine solving the aforementioned problems.

To this end, according to the present invention, the insertion guide plate has a pair of recesses preferably arranged pairwise therein and provided in a front end portion thereof so as to extend thereacross at positions where the recesses can face front corners of the sheet of paper which passes over the recesses, the recesses having a triangular cross section with a longer side positioned on the side of the front end of the insertion guide plate and with a shorter side positioned towards the rear end of said guide plate.

When a sheet of paper fed correctly onto the insertion guide plate hits against the front lays and stops thereat, the sensor receives light emitted by the sensor itself and reflected by the sheet of paper, so that normal paper feeding continues. When any corner folding occurs and the sheet of paper is stopped by the front lays, the light projected by the sensor reaches the exposed slanted bottom of the recess and is reflected diffusively due to such slanted shape of the exposed bottom. Thus the sensor does not receive the reflected light. As a result, a signal is generated to stop the paper feeding.

### Brief Description of the Drawings

The drawings show an embodiment of an abnormal-paper sensing apparatus in a printing machine according to this invention. More specifically

Fig. 1 shows a plan view of the left half of an insertion guide plate;

Fig. 2 shows an enlarged plan view of such portion of the insertion guide plate which includes a recess;

Fig. 3 shows a cross-section view taken along line A-A of Fig. 2; and

Fig. 4 shows a cross-section of a sensor including the vicinity thereof.

#### Detailed Description of the Preferred Embodiment

As shown in Figs. 1 to 4, an abnormal-paper sensing apparatus according to this invention and appropriate for being used in a not shown printing machine includes an elongated strip-like insertion guide plate or feedboard 1 which extends across the feeding direction of such printing machine. As becomes apparent from Fig. 4, the feedboard 1 is also supported to slant slightly between a paper feeder (not shown) and a printing unit (not shown). A plurality of leaf springs 2 are disposed parallel to each other across the machine and supported by slays 4 above the front end of the feedboard 1 by means of brackets 3. The front ends of the leaf springs 2 abut slidably onto an upper surface of the front end of the feedboard 1. A plurality of front lays 5 are supported in parallel with each other across the printing machine by a shaft 6 supported above the front end of the feedboard 1. The front lays 5 are received in corresponding grooves 1a provided at the front end of the feedboard 1 whereby a reciprocating rotation of the shaft 6 through a predetermined angle at a predetermined timing causes the front lays to fall and rise vertically relative to the feedboard 1 so that they are withdrawn therefrom, as shown. A sheet of paper 7 fed onto the feedboard 1 through a feeder board (not shown) from a paper feeder (not shown) is decelerated by the leaf springs 2 and hits against the front lays 2 to stop.

A pair of right and left recesses 8 are provided between right and left grooves 1a several millimeters 6 upstream of the front end of the feedboard 1. Each recess 8 has the form of a rectangle extending across the feedboard 1 and also a right-angled triangle in cross section having a longer side 8a positioned on the side of the front end of the feedboard 1 and a shorter side 8b positioned on the side of the rear end of the feedboard 1.

The inner surface of each recess 8 is coated with a black material. These recesses 8 are positioned and sized such that the end edge of a sheet of printing paper having any width between the maximum and minimum ones may pass over those recesses. Reference numeral 7 denotes a dash-dotted line showing one of several standard sizes of paper. A pair of brackets 11 are split-tightened in correspondence to the recesses 8 onto the stays 10 supported above the front end of the feedboard 1. Each bracket 11 has a reflection type sensor 12

fixed thereto through a holder 13 opposite to the corresponding recess 8. The sensor 12 is of the type which emits light and receives the light reflected by an object. In this embodiment, when the sensor receives no reflected light, it generates a signal which is delivered via a lead 14 to a controller (not shown) thereby to stop the paper feeding. In other words, when a sheet of paper 7 covers the recesses 8, light will be reflected, so that no signal is generated. The arrangement is such that when a sheet of paper 7 is folded at one of its front corners, the corresponding recess 8 is exposed, so that the projected light is reflected diffusively by the bottom surface of the recess 8. Thus, the diffused light is not received by the sensor 12, so that the sensor 12 generates a signal.

In operation, when the sheet of paper 7 fed from the feed device via the feeder board onto the feedboard 1 hits against the front lays 5 and stops thereat, the sheet of paper 7 normally shields the recesses 8, so that the light projected by the sensors 12 is reflected by the sheet of paper 7. Thus, the reflected light arrives at the sensors 12, so that the sensors 12 generate no signal and paper feeding continues. This means that when the sheet of paper 7 hits against the front lays and stops thereat, the shaft 6 is rotated clockwise in Fig. 4, the front lays 5 move away from the feedboard 1 and, at the same time, a pawl of a swing device (not shown) swings diagonally upwardly, captures the sheet of paper 7 and carries it to the printing unit.

When a sheet of paper having its corner folded is fed onto the feedboard 1 and hits against the front lays 5 and stops thereat, the folded corner of the sheet of paper does not shield so that the corresponding recess 8 is exposed. In this case, each recess 8 has a slanted inner surface asymmetrical with regard to a transverse plane therein and coated with a black material, so that the light projected from the sensors 12 is reflected diffusively by the bottom surface of the recess. Therefore, the reflected light does not arrive at the sensors 12, so that the sensors 12 produce a signal to stop the paper feeding. Thus the abnormal-sheet of paper with the folded corner is removed and printing is then resumed.

When a sheet of paper having a different size is used, the tightened brackets 11 are loosened and the sensors 12 are moved so as to cope with the different paper size.

As will become apparent from the aforementioned description, according to this invention, the insertion guide plate has a pair of recesses provided in a front end portion thereof so as to extend thereacross at positions where the recesses can face front corners of the sheet of paper which passes over the recesses, the recesses each hav-

ing a triangular cross section with a longer side positioned on the side of the front end of the insertion guide plate and with a shorter side positioned on the side of the rear end of the insertion guide plate. When a sheet of paper with a folded corner hits against the front lays and stops thereat, the corresponding recess is exposed, the light projected from the sensor to the exposed recess is securely reflected diffusively by the asymmetrically slanted notch-like bottom surface of the recess. In addition, even when a sheet of paper having a different size is used, which has a folded corner, it does not cover the corresponding recess, so that the reflected light does not reach the sensor. Therefore, corner folding is reliably sensed, irrespective of the paper size, so as to stop the paper feeding to improve the sensing accuracy thereby. The front-side portion of the recess bottom is gently inclined, so that a corner of a normal sheet of paper is not hooked, thereby reducing the quantity of wasted paper. In addition, the recesses do not extend through the insertion guide plate, so that it has a strength greater than the conventional one. If the recess bottom is coated with a black material, sensing will be improved even further.

## Claims

1. An abnormal-paper sensing apparatus in a printing machine, which apparatus includes at least one sensor (12) for sensing the presence of a front folded corner of a sheet of paper (7) which hits against front lays (5) provided at a front end of an insertion guide plate (1) and stops, following the absence of reflected light due to the folded corner, **characterized in** that said insertion guide plate has recesses (8) at positions where such recesses can face traverse edges of the sheet of paper which passes over the recesses, each of said recesses having a cross section such that said sensor senses no reflected light even if the sheet is in an abnormal state and is not present at a sensing point.

2. An apparatus as claimed in claim 1, **characterized in** that the recesses (8) are arranged pairwise in said guide plate (1).

3. An apparatus as claimed in claim 1 or 2, **characterized in** that the cross section of said recesses (8) has a shape having a longer side (8a) positioned on the side of the front end of said insertion guide plate (1) and a shorter side (8b) positioned towards the rear end of said insertion guide plate.

4. An apparatus as claimed in anyone of claims 1 to 3, **characterized in** that each recess (8) has a right-angled triangular cross section.

5. An apparatus as claimed in anyone of claims 1 to 4, **characterized in** that it includes a black material coated on the inner surface of the recesses (8) for absorbing light which the material has received.

6. An apparatus in a printing machine having an insertion guide plate (1) for receiving and inserting a sheet of paper (7) into a printing unit, and a plurality of front lays (5) provided above a front end of said insertion guide plate for adjusting the position of the sheet of paper, **characterized in** that

said insertion guide plate has a pair of recesses (8) provided along either side thereof such that they can face the corresponding corners of the sheet which passes over the recesses, the recesses having a structure for creating diffused reflection;

a pair of sensors (12) for projecting light against the recesses and for receiving light reflected by the recesses;

the arrangement being such that when a sheet of paper having a front folded corner passes over the recesses, the light projected by said sensors is reflected in a diffused manner by said recess and not received by said sensors, thus stopping the paper feeding.

7. An apparatus as claimed in claim 6, **characterized in** that each recess (8) has a triangular cross section.

8. An apparatus as claimed in claim 7, **characterized in** that the inner surface of said recesses (8) is coated with a black material for causing absorption of reflected light.

9. An apparatus as claimed in claim 6 or 7, **characterized in** that said recesses (8) have a transverse length enough to permit the sensing of an abnormal sheet of paper having a width of a predetermined range.

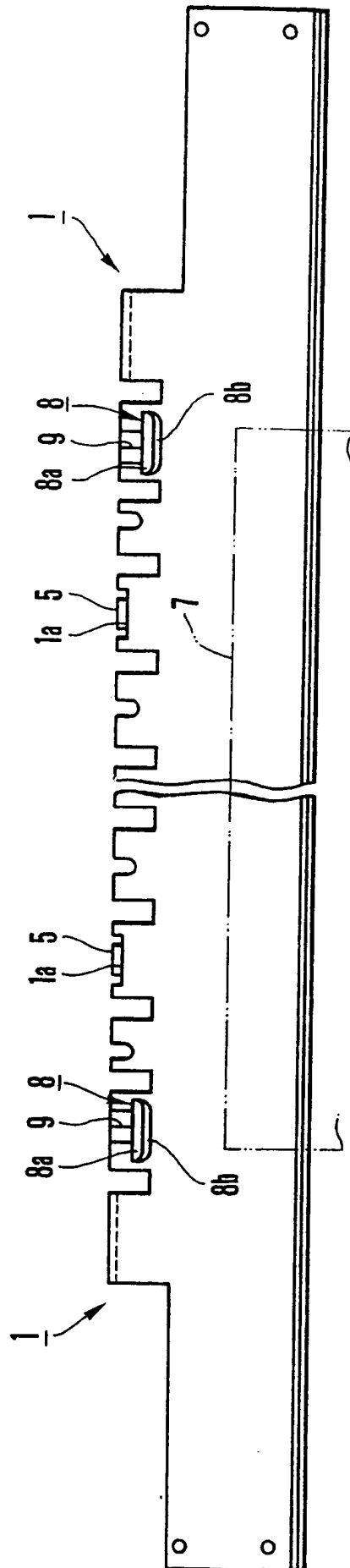


FIG.1

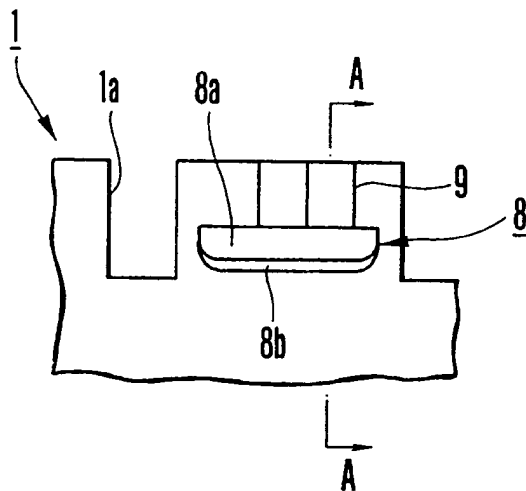


FIG. 2

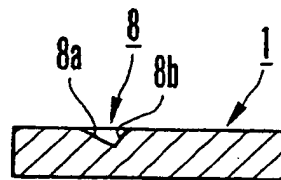


FIG. 3

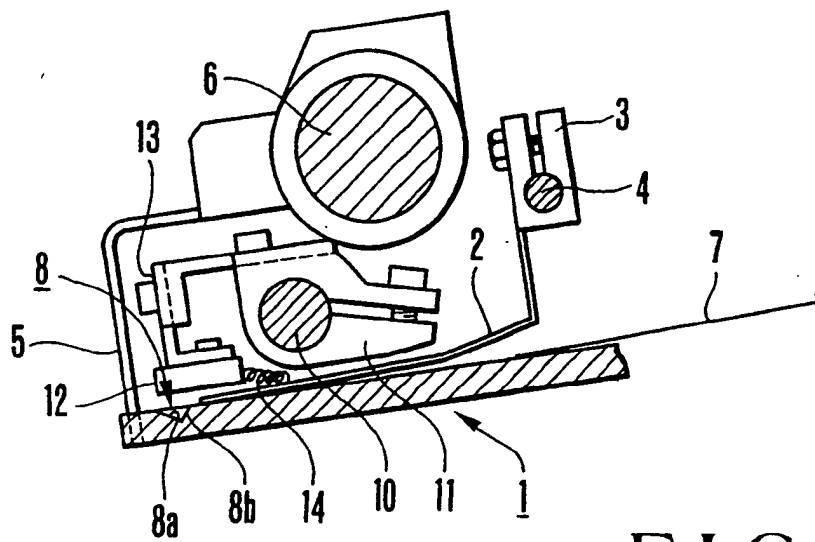


FIG. 4



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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
Y	US-A-3 647 205 (POLYGRAPH LEIPZIG) * Column 5, lines 1-27; figures * ---	1,2,5,6 ,8	B 65 H 9/20
Y	DE-A-3 336 721 (ERHARDT) * Page 11, line 17 - page 13, line 11; figure 1 * ---	1,2,5,6 ,8	
Y	FR-A-2 155 578 (AB PRINTING EQUIPMENT) * Page 3, line 12 - page 4, line 24; figures * -----	1,2,5,6 ,8	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B 65 H B 41 F G 06 K
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 01-08-1988	Examiner LONCKE J.W.
CATEGORY OF CITED DOCUMENTS			
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